Appendix 2
Safety Data by Pipeline Segment

Sections 2.1 through 2.7 present release data for each of the seven segments of the proposed pipeline. Section 2.8 presents data for Existing Pipeline ROW Alternative Mitigation Segments EP-1 and EP-2.

2.1 Segment 1 (MP 0.3–6.1) – Contra Costa County and Carquinez Strait

There are three different sections of pipe within this segment: the proposed new 20-inch-diameter pipe, the existing 14-inch-diameter pipe beneath the Carquinez Strait, and two sections of new 14-inch pipe which connect the existing 14-inch Carquinez Strait crossing to the proposed pig launchers/receivers. The anticipated frequency of unintentional releases from each of these sections of pipe are summarized in the following tables.

Table Ap.2-1. Anticipated Unintentional Releases from Proposed Pipeline, Segment 1 (MP 0–6.1), 4.835 Miles of New 20-Inch-Diameter Pipe

Unintentional Release Cause	Unintentional Release Rate (Releases per 1,000 mile-years)	Pipeline Section Length (miles)	Unintentional Releases per Year	Recurrence Interval (years)
External corrosion	1.00	4.835	0.0048	207
Internal corrosion	0.19	4.835	0.0009	1,089
3rd party damage	0.40	4.835	0.0019	517
Human operating error	0.11	4.835	0.0005	1,880
Design flaw	0.03	4.835	0.0001	6,894
Equipment malfunction	0.37	4.835	0.0018	559
Maintenance	0.07	4.835	0.0003	2,955
Weld failure	0.26	4.835	0.0013	795
Other	0.45	4.835	0.0022	460
Total, all unintentional releases, regardless of volume	2.88	4.835	0.0139	72
DOT reportable unintentional releases (50 barrels or greater)	1.10	4.835	0.0053	188
Injuries, regardless of severity	0.685	4.835	0.0033	302
Injuries requiring hospitalization, causing loss of consciousness, or preventing discharge of normal duties the day following the incident	0.150	4.835	0.0007	1,379
Fire	Probability for fire incidents is less than the probability of the releases shown in this table because, in addition to presence of product, a fire requires the presence of an appropriate source of ignition.			
Fatalities	0.042	4.835	0.0002	4,924

The anticipated number of unintentional releases per year and the unintentional release recurrence intervals were presented in Table Ap.2-4 for any newly constructed one-mile, 20-inch-diameter pipe segment.

Probable Unintentional Release Volume Distribution. The anticipated release volume distribution data is presented in Table Ap.2-2. The methodology for these calculations was presented earlier, in Section C.2.1 of this report. As noted earlier, these data assume a release incident rate of 2.88 incidents per 1,000 mile-years for any volume release.

Table Ap.2-2. Anticipated Unintentional Release Volume Distribution from Proposed Pipeline, Segment 1 (MP 0–6.1), 4.835 Miles of New 20-Inch Pipe

Unintentional Release Volume, Barrels (gallons)	Anticipated Unintentional Releases Per Year – Entire 4.835-Mile Section	Anticipated Recurrence Interval (Years) – Entire 4.835-Mile Section	Anticipated Unintentional Releases Per Year – Any One-Mile Section	Anticipated Recurrence Interval (Years) – Any One-Mile Section	Anticipated Unintentional Releases During 50-Year Project Life
All Unintentional Releases (regardless of volume)	0.0139	72	0.00288	347	0.70
Small Unintentional Release					
≥1 (42)	0.0133	75	0.00275	363	0.67
≥5 (210)	0.0102	98	0.00210	476	0.51
≥10 (420)	0.0085	118	0.00175	572	0.42
≥50 (2,100)	0.0053	188	0.00110	907	0.27
Medium Unintentional Release					
≥100 (4,200)	0.0040	248	0.000834	1,199	0.20
≥500 (21,000)	0.0024	425	0.000487	2,053	0.12
Large Unintentional Release					
≥1,000 (42,000)	0.0019	539	0.000384	2,607	0.09
≥5,000 (210,000)	0.0007	1,532	0.000135	7,413	0.03
Very Large Unintentional Release					
≥10,000 (420,000)	0.0003	2,997	0.000069	14,594	0.02

Phase 1 Carquinez Strait Crossing

The proposed Carquinez Strait Crossing would use the existing 14-inch-diameter pipeline, with segments of new 14-inch-diameter pipeline at either end. The anticipated frequency of unintentional releases from both the existing and new 14-inch-diameter pipeline, are summarized in Tables Ap.2-3 and Ap.2-4.

Table Ap.2-3. Anticipated Unintentional Releases from Proposed Pipeline, Segment 1 (MP 0–6.1), Existing 1.114-Mile, 14-Inch-Diameter Carquinez Strait Crossing

Unintentional Release Cause	Unintentional Release Rate (Releases per 1,000 mile-years)	Pipeline Section Length (miles)	Unintentional Releases per Year	Recurrence Interval (years)
External corrosion	2.00	1.114	0.00223	449
Internal corrosion	0.19	1.114	0.00021	4,725
3rd party damage	1.00	1.114	0.00111	898
Human operating error	0.11	1.114	0.00012	8,161
Design flaw	0.03	1.114	0.00003	29,922
Equipment malfunction	0.37	1.114	0.00041	2,426
Maintenance	0.07	1.114	0.00008	12,824
Weld failure	0.26	1.114	0.00029	3,453
Other	0.45	1.114	0.00050	1,995
Total, all unintentional releases, regardless of volume	4.48	1.114	0.00499	200
DOT reportable unintentional releases (50 barrels or greater)	1.30	1.114	0.00145	691
Injuries, regardless of severity	0.685	1.114	0.00076	1,310
Injuries requiring hospitalization, causing loss of consciousness, or preventing discharge of normal duties the day following the incident	0.150	1.114	0.00017	5,984
Fire	Probability for fire incidents is less than the probability of the releases shown in this table because, in addition to presence of product, a fire requires the presence of an appropriate source of ignition.			
Fatalities	0.042	1.114	0.00005	21,373

Table Ap.2-4. Anticipated Unintentional Releases from Proposed Pipeline, Segment 1 (MP 0–6.1), 0.385 Miles of New 14-Inch Pipe at Carquinez Strait Crossing

Unintentional Release Cause	Unintentional Release Rate (Releases per 1,000 mile-years)	Pipeline Section Length (miles)	Unintentional Releases per Year	Recurrence Interval (years)
External corrosion	1.00	0.385	0.00039	2,597
Internal corrosion	0.19	0.385	0.00007	13,671
3rd party damage	0.40	0.385	0.00015	6,494
Human operating error	0.11	0.385	0.00004	23,613
Design flaw	0.03	0.385	0.00001	86,580
Equipment malfunction	0.37	0.385	0.00014	7,020
Maintenance	0.07	0.385	0.00003	37,106
Weld failure	0.26	0.385	0.00010	9,990
Other	0.45	0.385	0.00017	5,772
Total, all unintentional releases, regardless of volume	2.88	0.385	0.00111	902
DOT reportable unintentional releases (50 barrels or greater)	0.834	0.385	0.00032	3,114
Injuries, regardless of severity	0.685	0.385	0.00026	3,792
Injuries requiring hospitalization, causing loss of consciousness, or preventing discharge of normal duties the day following the incident	0.150	0.385	0.00006	17,316
Fire	Probability for fire incidents is less than the probability of the releases shown in this table because, in addition to presence of product, a fire requires the presence of an appropriate source of ignition.			
Fatalities	0.042	0.385	0.00002	61,843

Probable Unintentional Release Volume Distribution. The anticipated unintentional release volume distribution data are presented in Table Ap.2-5 and Ap.2-6 for the existing and proposed new 14-inch-diameter pipe respectively. These data assume an unintentional release frequency of 2.88 releases per 1,000 mile-years for new pipe and 4.48 releases per 1,000 mile-years for the existing pipeline.

Table Ap.2-5. Anticipated Unintentional Release Volume Distribution from Proposed Pipeline, Segment 1 (MP 0–6.1), Existing 1.114-Mile, 14-Inch-Diameter Carquinez Strait Crossing

Unintentional Release Volume, Barrels (gallons)	Anticipated Unintentional Releases Per Year – Entire 1.114-Mile Section	Anticipated Recurrence Interval (Years) – Entire 1.114-Mile Section	Anticipated Unintentional Releases Per Year – Any One-Mile Section	Anticipated Recurrence Interval (Years) – Any One-Mile Section	Anticipated Unintentional Releases During 50-Year Project Life
All Unintentional Releases (regardless of volume)	0.0050	200	0.00448	223	0.250
Small Unintentional Release ≥1 (42)	0.0046	216	0.00416	241	0.232
≥5 (210)	0.0030	330	0.00272	368	0.151
≥10 (420)	0.0024	416	0.00216	463	0.120
≥50 (2,100)	0.0014	691	0.00130	771	0.072
Medium Unintentional Release ≥100 (4,200)	0.0011	889	0.00101	987	0.056
≥500 (21,000)	0.0007	1,529	0.000587	1,703	0.033
Large Unintentional Release ≥1,000 (42,000)	0.0005	2,107	0.000426	2,346	0.024
≥5,000 (210,000)	0.0001	8,549	0.000105	9,495	0.006
Very Large Unintentional Release ≥10,000 (420,000)	0.0001	14,249	0.000063	15,869	0.004

Table Ap.2-6. Anticipated Unintentional Release Volume Distribution from Proposed Pipeline, Segment 1 (MP 0–6.1), 0.385 Miles of New 14-Inch-Diameter Pipe at Carquinez Strait Crossing

Unintentional Release Volume, Barrels (gallons)	Anticipated Unintentional Releases Per Year – Entire 0.385-Mile Section	Anticipated Recurrence Interval (Years) – Entire 0.385-Mile Section	Anticipated Unintentional Releases Per Year – Any One-Mile Section	Anticipated Recurrence Interval (Years) – Any One-Mile Section	Anticipated Unintentional Releases During 50-Year Project Life
All Unintentional Releases (regardless of volume)	0.0011	902	0.00288	347	0.055
Small Unintentional Release ≥1 (42)	0.0010	973	0.00267	374	0.051
≥5 (210)	0.00067	1,484	0.00175	572	0.034
≥10 (420)	0.00054	1,869	0.00139	720	0.027
≥50 (2,100)	0.00032	3,114	0.000834	1,199	0.016
Medium Unintentional Release ≥100 (4,200)	0.00025	3,984	0.000652	1,535	0.013
≥500 (21,000)	0.00015	6,871	0.000378	2,649	0.0073
Large Unintentional Release ≥1,000 (42,000)	0.00011	9,480	0.000274	3,650	0.0053
≥5,000 (210,000)	0.00003	38,197	0.000068	14,770	0.0013
Very Large Unintentional Release ≥10,000 (420,000)	0.00002	63,351	0.000041	24,685	0.0008

Phase 2 Carquinez Strait Crossing

Phase 2 of the Carquinez Strait Crossing would involve replacing the existing 14-inch-diameter pipeline with a new 20-inch-diameter pipeline. Segment 1 would be 6.34 miles long and would be made entirely of new 20-inch-diameter pipe. The anticipated frequency of unintentional releases from this entire 6.34-mile pipe segment is summarized in Table Ap.2-7 below.

Table Ap.2-7. Anticipated Unintentional Releases from Proposed Pipeline, Segment 1 (MP 0–6.1), 6.34 Miles of New 20-Inch-Diameter Pipe, Carquinez Strait Crossing Phase 2

Unintentional Release Cause	Unintentional Release Rate (per1,000 mile-years)	Pipeline Section Length (miles)	Unintentional Releases per Year	Recurrence Interval (years)
External corrosion	1.00	6.34	0.0063	158
Internal corrosion	0.19	6.34	0.0012	830
3rd party damage	0.40	6.34	0.0025	394
Human operating error	0.11	6.34	0.0007	1,434
Design flaw	0.03	6.34	0.0002	5,258
Equipment malfunction	0.37	6.34	0.0023	426
Fire	Probability for fire incidents is less than the probability of the releases shown in this table because, in addition to presence of product, a fire requires the presence of an appropriate source of ignition.			
Maintenance	0.07	6.34	0.0004	2,253
Weld failure	0.26	6.34	0.0016	607
Other	0.45	6.34	0.0029	351
Total, all unintentional releases, regardless of volume	2.88	6.34	0.0183	55
DOT reportable unintentional releases (50 barrels or greater)	1.10	6.34	0.0070	143
Injuries, regardless of severity	0.685	6.34	0.0043	230
Injuries requiring hospitalization, causing loss of consciousness, or preventing discharge of normal duties the day following the incident	0.150	6.34	0.0010	1,052
Fatalities	0.042	6.34	0.0003	3,755

The anticipated number of incidents per year and the incident recurrence intervals have been previously provided in Table Ap.2-8 for incidents from any newly constructed one mile pipe segment.

Probable Unintentional Release Volume Distribution. The anticipated unintentional release volume distribution data is presented in Table Ap.2-8 for the 6.34-mile, new 20-inch pipe segment. These data assume 2.88 unintentional releases per 1,000 mile-years, regardless of release volume.

Table Ap.2-8. Anticipated Unintentional Release Volume Distribution from Proposed Pipeline, Segment 1 (MP 0–6.1), 6.34 Miles of New 20-Inch Pipe, Carquinez Strait Crossing Phase 2

Unintentional Release Volume, Barrels (gallons)	Anticipated Unintentional Releases Per Year – Entire 6.34-Mile Section	Anticipated Recurrence Interval (Years) – Entire 6.34-Mile Section	Anticipated Unintentional Releases Per Year – Any One-Mile Section	Anticipated Recurrence Interval (Years) – Any One-Mile Section	Anticipated Unintentional Releases During 50-Year Project Life
All Unintentional Releases (regardless of volume)	0.0183	55	0.00288	347	0.91
Small Unintentional Release ≥1 (42)	0.0174	57	0.00275	363	0.87
≥5 (210)	0.0133	75	0.00210	476	0.67
≥10 (420)	0.0111	90	0.00175	572	0.55
≥50 (2,100)	0.0070	143	0.00110	907	0.35
Medium Unintentional Release ≥100 (4,200)	0.0053	189	0.000834	1,199	0.26
≥500 (21,000)	0.0031	324	0.000487	2,053	0.15
Large Unintentional Release ≥1,000 (42,000)	0.0024	411	0.000384	2,607	0.12
≥5,000 (210,000)	0.0009	1,168	0.000135	7,413	0.04
Very Large Unintentional Release ≥10,000 (420,000)	0.0004	2,286	0.000069	14,594	0.02

Summary of Data for Three Pipe Sections within Segment 1 (MP 0–6.1)

The above unintentional release data has been compiled for Segment 1 in Table Ap.2-9 below.

Table Ap.2-9. Summary of Unintentional Release Data for Segment 1 (MP 0–6.1)

	Phase 1				Phase 2
Project Description	Existing 14-Inch	New 14-Inch	New 20-Inch	Total	New 20-Inch
Length (miles)	1.114	0.385	4.835	6.334	6.34
Anticipated Recurrence Intervals (years)					
Small (≥1 bbl)	216	973	75	53	57
Medium (≥100 bbl)	889	3,984	248	185	189
Large (≥1,000 bbl)	2,107	9,480	539	411	411
Very Large (≥10,000 bbl)	14,249	63,351	2,997	2,383	2,286
Anticipated Number of Incidents During 50-Year Pipeline Life					
Small (≥1 bbl)	0.232	0.051	0.67	0.95	0.87
Medium (≥100 bbl)	0.056	0.013	0.2	0.27	0.26
Large (≥1,000 bbl)	0.024	0.0053	0.09	0.12	0.12
Very Large (≥10,000 bbl)	0.0035	0.00078	0.017	0.021	0.022

2.2 Segment 2 (MP 6.1–17.6) – Benicia and I-680 Frontage

The anticipated frequency of unintentional releases from this segment is summarized in Table Ap.2-10 below.

Table Ap.2-10. Anticipated Unintentional Releases from Proposed 11.43-Mile, 20-Inch-Diameter Pipeline, Segment 2 (MP 6.1–17.6)

Unintentional Release Cause	Unintentional Release Rate (Releases per 1,000 mile-years)	Pipeline Section Length (miles)	Unintentional Releases per Year	Recurrence Interval (years)
External corrosion	1.00	11.43	0.0114	87
Internal corrosion	0.19	11.43	0.0022	460
3rd party damage	0.40	11.43	0.0046	219
Human operating error	0.11	11.43	0.0013	795
Design flaw	0.03	11.43	0.0003	2,916
Equipment malfunction	0.37	11.43	0.0042	236
Maintenance	0.07	11.43	0.0008	1,250
Weld failure	0.26	11.43	0.0030	336
Other	0.45	11.43	0.0051	194
Total, all unintentional releases, regardless of unintentional release volume	2.88	11.43	0.0329	30
DOT reportable unintentional releases (50 barrels or greater)	1.10	11.43	0.0126	80
Injuries, regardless of severity	0.685	11.43	0.0078	128
Injuries requiring hospitalization, causing loss of consciousness, or preventing discharge of normal duties the day following the incident	0.150	11.43	0.0017	583
Fire	Probability for fire incidents is less than the probability of the releases shown in this table because, in addition to presence of product, a fire requires the presence of an appropriate source of ignition.			
Fatalities	0.042	11.43	0.0005	2,083

Probable Unintentional Release Volume Distribution. The anticipated unintentional release volume distribution data is presented in Table Ap.2-11. As noted above, these data assume a frequency of 2.88 unintentional releases per 1,000 mile-years for any release from the proposed new 20-inch-diameter pipe.

Table Ap.2-11. Anticipated Unintentional Release Volume Distribution from Proposed 11.43-Mile, 20-Inch-Diameter Pipeline, Segment 2 (MP 6.1–17.6)

Unintentional Release Volume, Barrels (gallons)	Anticipated Unintentional Releases Per Year – Entire 11.43-Mile Section	Anticipated Recurrence Interval (Years) – Entire 11.43-Mile Section	Anticipated Unintentional Releases Per Year – Any One-Mile Section	Anticipated Recurrence Interval (Years) – Any One-Mile Section	Anticipated Unintentional Releases During 50-Year Project Life
All Unintentional Releases (regardless of volume)	0.0329	30	0.00288	347	1.65
Small Unintentional Release ≥1 (42)	0.0314	32	0.00275	363	1.57
≥5 (210)	0.0240	42	0.00210	476	1.20
≥10 (420)	0.0200	50	0.00175	572	1.00
≥50 (2,100)	0.0126	80	0.00110	907	0.63
Medium Unintentional Release ≥100 (4,200)	0.0095	105	0.000834	1,199	0.48
≥500 (21,000)	0.0056	180	0.000487	2,053	0.28
Large Unintentional Release ≥1,000 (42,000)	0.0044	228	0.000384	2,607	0.22
≥5,000 (210,000)	0.0015	648	0.000135	7,413	0.08
Very Large Unintentional Release ≥10,000 (420,000)	0.0008	1,268	0.000069	14,594	0.04

2.3 Segment 3 (MP 17.6–24.5) – Cordelia

The anticipated frequency of unintentional releases for Segment 3 is summarized in Table Ap.2-12.

Table Ap.2-12. Anticipated Unintentional Releases from Proposed 6.95-Mile, 20-Inch-Diameter Pipeline, Segment 3 (MP 17.6–24.5)

Unintentional Release Cause	Unintentional Release Rate (Releases per 1,000 mile-years)	Pipeline Section Length (miles)	Unintentional Releases per Year	Recurrence Interval (years)
External corrosion	1.00	6.95	0.0070	144
Internal corrosion	0.19	6.95	0.0013	757
3rd party damage	0.40	6.95	0.0028	360
Human operating error	0.11	6.95	0.0008	1,308
Design flaw	0.03	6.95	0.0002	4,796
Equipment malfunction	0.37	6.95	0.0026	389
Maintenance	0.07	6.95	0.0005	2,055
Weld failure	0.26	6.95	0.0018	553
Other	0.45	6.95	0.0031	320
Total, all unintentional releases, regardless of volume	2.88	6.95	0.0200	50
DOT reportable unintentional releases (50 barrels or greater)	1.10	6.95	0.0076	131
Injuries, regardless of severity	0.685	6.95	0.0048	210
Injuries requiring hospitalization, causing loss of consciousness, or preventing discharge of normal duties the day following the incident	0.150	6.95	0.0010	959
Fire	Probability for fire incidents is less than the probability of the releases shown in this table because, in addition to presence of product, a fire requires the presence of an appropriate source of ignition.			
Fatalities	0.042	6.95	0.0003	3,426

Probable Unintentional Release Volume Distribution. The anticipated unintentional release volume distribution data is presented in Table Ap.2-13. The methodology for these calculations was presented earlier, in Section C.2.1 of this report. As noted earlier, these data assume an unintentional release rate of 2.88 releases per 1,000 mile-years, for any volume release from the proposed new 20-inch-diameter line.

Table Ap.2-13. Anticipated Unintentional Release Volume Distribution from Proposed 6.95-Mile, 20-Inch-Diameter Pipeline, Segment 3 (MP 17.6–24.5)

Unintentional Release Volume, Barrels (gallons)	Anticipated Unintentional Releases Per Year – Entire 6.95-Mile Section	Anticipated Recurrence Interval (Years) – Entire 6.95-Mile Section	Anticipated Unintentional Releases Per Year – Any One-Mile Section	Anticipated Recurrence Interval (Years) – Any One-Mile Section	Anticipated Unintentional Releases During 50-Year Project Life
All Unintentional Releases (regardless of volume)	0.0200	50	0.00288	347	1.00
Small Unintentional Release ≥1 (42)	0.0191	52	0.00275	363	0.96
≥5 (210)	0.0146	69	0.00210	476	0.73
≥10 (420)	0.0122	82	0.00175	572	0.61
≥50 (2,100)	0.0076	131	0.00110	907	0.38
Medium Unintentional Release ≥100 (4,200)	0.0058	173	0.000834	1,199	0.29
≥500 (21,000)	0.0034	295	0.000487	2,053	0.17
Large Unintentional Release ≥1,000 (42,000)	0.0027	375	0.000384	2,607	0.13
≥5,000 (210,000)	0.0009	1,066	0.000135	7,413	0.05
Very Large Unintentional Release ≥10,000 (420,000)	0.0005	2,085	0.000069	14,594	0.02

2.4 Segment 4 (MP 24.5–30.7) – Fairfield/Suisun City

For Segment 4, the anticipated frequency of unintentional releases is summarized in Table Ap.2-14 below.

Probable Unintentional Release Volume Distribution. The anticipated unintentional release volume distribution data is presented in Table Ap.2-15. The methodology for these calculations was presented earlier in Section C.2.1 of this document. As noted earlier, these data assume an unintentional release rate of 2.88 incidents per 1,000 mile-years, for any volume release from the proposed new 20-inch pipeline.

Table Ap.2-14. Anticipated Unintentional Releases from Proposed 6.2-Mile, 20-Inch-Diameter Pipeline, Segment 4 (MP 24.5–30.7)

Unintentional Release Cause	Unintentional Release Rate (Releases per 1,000 mile-years)	Pipeline Section Length (miles)	Unintentional Releases per Year	Recurrence Interval (years)
External corrosion	1.00	6.2	0.0062	161
Internal corrosion	0.19	6.2	0.0012	849
3rd party damage	0.40	6.2	0.0025	403
Human operating error	0.11	6.2	0.0007	1,466
Design flaw	0.03	6.2	0.0002	5,376
Equipment malfunction	0.37	6.2	0.0023	436
Maintenance	0.07	6.2	0.0004	2,304
Weld failure	0.26	6.2	0.0016	620
Other	0.45	6.2	0.0028	358
Total, all unintentional releases, regardless of volume	2.88	6.2	0.0179	56
DOT reportable unintentional releases (50 barrels or greater)	1.10	6.2	0.0068	147
Injuries, regardless of severity	0.685	6.2	0.0042	235
Injuries requiring hospitalization, causing loss of consciousness, or preventing discharge of normal duties the day following the incident	0.150	6.2	0.0009	1,075
Fire	Probability for fire incidents is less than the probability of the releases shown in this table because, in addition to presence of product, a fire requires the presence of an appropriate source of ignition.			
Fatalities	0.042	6.2	0.0003	3,840

Table Ap.2-15. Anticipated Unintentional Release Volume Distribution from Proposed 6.2-Mile, 20-Inch-Diameter Pipeline, Segment 4 (MP 24.5–30.7)

Unintentional Release Volume, Barrels (gallons)	Anticipated Unintentional Releases Per Year – Entire 6.2-Mile Section	Anticipated Recurrence Interval (Years) – Entire 6.2-Mile Section	Anticipated Unintentional Releases Per Year – Any One-Mile Section	Anticipated Recurrence Interval (Years) – Any One-Mile Section	Anticipated Unintentional Releases During 50-Year Project Life
All Unintentional Releases (regardless of volume)	0.0179	56	0.00288	347	0.89
Small Unintentional Release					
≥1 (42)	0.0171	59	0.00275	363	0.85
≥5 (210)	0.0130	77	0.00210	476	0.65
≥10 (420)	0.0109	92	0.00175	572	0.54
≥50 (2,100)	0.0068	147	0.00110	907	0.34
Medium Unintentional Release					
≥100 (4,200)	0.0052	193	0.000834	1,199	0.26
≥500 (21,000)	0.0030	331	0.000487	2,053	0.15
Large Unintentional Release					
≥1,000 (42,000)	0.0024	420	0.000384	2,607	0.12
≥5,000 (210,000)	0.0008	1,195	0.000135	7,413	0.04
Very Large Unintentional Release					
≥10,000 (420,000)	0.0004	2,338	0.000069	14,594	0.02

2.5 Segment 5 (MP 30.7–55.1) – Solano and Yolo Counties Agricultural Area

For Segment 5, the anticipated frequency of unintentional releases is presented in Table Ap.2-16 below.

Table Ap.2-16. Anticipated Unintentional Releases from Proposed 34.4-Mile, 20-Inch-Diameter Pipeline, Segment 5 (MP 30.7–65.1)

Unintentional Release Cause	Unintentional Release Rate (Releases per 1,000 mile-years)	Pipeline Section Length (miles)	Unintentional Releases per Year	Recurrence Interval (years)
External corrosion	1.00	34.4	0.0344	29
Internal corrosion	0.19	34.4	0.0065	153
3rd party damage	0.40	34.4	0.0138	73
Human operating error	0.11	34.4	0.0038	264
Design flaw	0.03	34.4	0.0010	969
Equipment malfunction	0.37	34.4	0.0127	79
Maintenance	0.07	34.4	0.0024	415
Weld failure	0.26	34.4	0.0089	112
Other	0.45	34.4	0.0155	65
Total, all unintentional releases, regardless of volume	2.88	34.4	0.0991	10
DOT reportable unintentional releases (50 barrels or greater)	1.10	34.4	0.0378	26
Injuries, regardless of severity	0.685	34.4	0.0236	42
Injuries requiring hospitalization, causing loss of consciousness, or preventing discharge of normal duties the day following the incident	0.150	34.4	0.0052	194
Fire	Probability for fire incidents is less than the probability of the releases shown in this table because, in addition to presence of product, a fire requires the presence of an appropriate source of ignition.			
Fatalities	0.042	34.4	0.0014	692

Probable Unintentional Release Volume Distribution. The anticipated unintentional release volume distribution data for this segment is presented in Table Ap.2-17. The methodology for these calculations was presented earlier in Section C.2.1 of this document. As noted earlier, these data assume a frequency of 2.88 unintentional releases per 1,000 mile-years for any volume release from the proposed new 20-inch-diameter line.

2.6 Segment 6 (MP 65.1–70) – West Sacramento

For this segment, the anticipated frequency of unintentional releases is presented in Table Ap.2-18 below.

Table Ap.2-17. Anticipated Unintentional Release Volume Distribution from Proposed 34.4-Mile, 20-Inch-Diameter Pipeline, Segment 5 (MP 30.7–65.1)

Unintentional Release Volume, Barrels (gallons)	Anticipated Unintentional Releases Per Year – Entire 34.4-Mile Section	Anticipated Recurrence Interval (Years) – Entire 34.4-Mile Section	Anticipated Unintentional Releases Per Year – Any One-Mile Section	Anticipated Recurrence Interval (Years) – Any One-Mile Section	Anticipated Unintentional Releases During 50-Year Project Life
All Unintentional Releases (regardless of volume)	0.0991	10	0.00288	347	4.95
Small Unintentional Release ≥1 (42)	0.0946	11	0.00275	363	4.73
≥5 (210)	0.0722	14	0.00210	476	3.61
≥10 (420)	0.0602	17	0.00175	572	3.01
≥50 (2,100)	0.0378	26	0.00110	907	1.90
Medium Unintentional Release ≥100 (4,200)	0.0287	35	0.000834	1,199	1.43
≥500 (21,000)	0.0168	60	0.000487	2,053	0.84
Large Unintentional Release ≥1,000 (42,000)	0.0132	76	0.000384	2,607	0.66
≥5,000 (210,000)	0.0046	215	0.000135	7,413	0.23
Very Large Unintentional Release ≥10,000 (420,000)	0.0024	421	0.000069	14,594	0.12

Table Ap.2-18. Anticipated Unintentional Releases from Proposed 4.9-Mile, 20-Inch-Diameter Pipeline, Segment 6 (MP 65.1–70)

Unintentional Release Cause	Unintentional Release Rate (Releases per 1,000 mile-years)	Pipeline Section Length (miles)	Unintentional Releases per Year	Recurrence Interval (years)
External corrosion	1.00	4.9	0.0049	204
Internal corrosion	0.19	4.9	0.0009	1,074
3rd party damage	0.40	4.9	0.0020	510
Human operating error	0.11	4.9	0.0005	1,855
Design flaw	0.03	4.9	0.0001	6,803
Equipment malfunction	0.37	4.9	0.0018	552
Maintenance	0.07	4.9	0.0003	2,915
Weld failure	0.26	4.9	0.0013	785
Other	0.45	4.9	0.0022	454
Total, all unintentional releases, regardless of volume	2.88	4.9	0.0141	71
DOT reportable unintentional releases (50 barrels or greater)	1.10	4.9	0.0054	186
Injuries, regardless of severity	0.685	4.9	0.0034	298
Injuries requiring hospitalization, causing loss of consciousness, or preventing discharge of normal duties the day following the incident	0.150	4.9	0.0007	1,361
Fire	Probability for fire incidents is less than the probability of the releases shown in this table because, in addition to presence of product, a fire requires the presence of an appropriate source of ignition.			
Fatalities	0.042	4.9	0.0002	4,859

Probable Unintentional Release Volume Distribution. The anticipated unintentional release volume distribution data is presented in Table Ap.2-19. The methodology for these calculations was presented earlier in Section C.2.1 of this document. As noted earlier, these data assume a frequency of 2.88 unintentional releases per 1,000 mile-years for any volume release from the proposed new 20-inch-diameter pipe.

Table Ap.2-19. Anticipated Unintentional Release Volume Distribution from Proposed 4.9-Mile, 20-Inch-Diameter Pipeline, Segment 6 (MP 65.1–70)

Unintentional Release Volume, Barrels (gallons)	Anticipated Unintentional Releases Per Year – Entire 4.9-Mile Section	Anticipated Recurrence Interval (Years) – Entire 4.9-Mile Section	Anticipated Unintentional Releases Per Year – Any One-Mile Section	Anticipated Recurrence Interval (Years) – Any One-Mile Section	Anticipated Unintentional Releases During 50-Year Project Life
All Unintentional Releases (regardless of volume)	0.0141	71	0.00288	347	0.71
Small Unintentional Release ≥1 (42)	0.0135	74	0.00275	363	0.67
≥5 (210)	0.0103	97	0.00210	476	0.51
≥10 (420)	0.0086	117	0.00175	572	0.43
≥50 (2,100)	0.0054	186	0.00110	907	0.27
Medium Unintentional Release ≥100 (4,200)	0.0041	245	0.000834	1,199	0.20
≥500 (21,000)	0.0024	419	0.000487	2,053	0.12
Large Unintentional Release ≥1,000 (42,000)	0.0019	531	0.000384	2,607	0.09
≥5,000 (210,000)	0.0007	1,512	0.000135	7,413	0.03
Very Large Unintentional Release ≥10,000 (420,000)	0.0003	2,958	0.000069	14,594	0.02

2.7 Segment 7 – Wickland Connection

The anticipated frequency of unintentional releases for the 12-inch Wickland Pipeline Connection is summarized in Table Ap.2-20. The anticipated frequency of unintentional releases from any one-mile section of the Wickland Connection is presented in Table Ap.2-21.

Table Ap.2-20. Anticipated Unintentional Releases from Proposed 4,100-Foot, 12-Inch-Diameter Wickland Pipeline Connection (Segment 7)

Unintentional Release Cause	Unintentional Release Rate (Releases per 1,000 mile-years)	Pipeline Section Length (miles)	Unintentional Releases per Year	Recurrence Interval (years)
External corrosion	1.00	0.78	0.00078	1,282
Internal corrosion	0.19	0.78	0.00015	6,748
3rd party damage	0.40	0.78	0.00031	3,205
Human operating error	0.11	0.78	0.00009	11,655
Design flaw	0.03	0.78	0.00002	42,735
Equipment malfunction	0.37	0.78	0.00029	3,465
Maintenance	0.07	0.78	0.00005	18,315
Weld failure	0.26	0.78	0.00020	4,931
Other	0.45	0.78	0.00035	2,849
Total, all unintentional releases, regardless of volume	2.88	0.78	0.00225	445
DOT reportable unintentional releases (50 barrels or greater)	0.749	0.78	0.00058	1,712
Injuries, regardless of severity	0.685	0.78	0.00053	1,872
Injuries requiring hospitalization, causing loss of consciousness, or preventing discharge of normal duties the day following the incident	0.150	0.78	0.00012	8,547
Fire	Probability for fire incidents is less than the probability of the releases shown in this table because, in addition to presence of products, a fire requires the presence of an appropriate source of ignition.			
Fatalities	0.042	0.78	0.00003	30,525

Table Ap.2-21. Anticipated Unintentional Releases from Any 1-Mile Section of the Proposed 12-Inch-Diameter Wickland Pipeline Connection (Segment 7)

Unintentional Release Cause	Unintentional Release Rate (Releases per 1,000 mile-years)	Pipeline Section Length (miles)	Unintentional Releases per Year	Recurrence Interval (years)
External corrosion	1.00	1	0.00100	1,000
Internal corrosion	0.19	1	0.00019	5,263
3rd party damage	0.40	1	0.00040	2,500
Human operating error	0.11	1	0.00011	9,091
Design flaw	0.03	1	0.00003	33,333
Equipment malfunction	0.37	1	0.00037	2,703
Maintenance	0.07	1	0.00007	14,286
Weld failure	0.26	1	0.00026	3,846
Other	0.45	1	0.00045	2,222
Total, all unintentional releases, regardless of volume	2.88	1	0.00288	347
DOT reportable unintentional releases (50 barrels or greater)	0.749	1	0.00075	1,335
Injuries, regardless of severity	0.685	1	0.00069	1,460
Injuries requiring hospitalization, causing loss of consciousness, or preventing discharge of normal duties the day following the incident	0.150	1	0.00015	6,667
Fire	Probability for fire incidents is less than the probability of the releases shown in this table because, in addition to presence of product, a fire requires the presence of an appropriate source of ignition.			
Fatalities	0.042	1	0.00004	23,810

The anticipated volume distribution of unintentional releases from the Wickland Connection is presented in Table Ap.2-22.

Table Ap.2-22. Anticipated Unintentional Release Volume Distribution from Proposed 4,100-Foot, 12-Inch-Diameter Wickland Pipeline Connection (Segment 7)

Unintentional Release Volume, Barrels (gallons)	Anticipated Unintentional Releases Per Year – Entire 0.78-Mile Section	Anticipated Recurrence Interval (Years) – Entire 0.78-Mile Section	Anticipated Releases Per Year – Any One-Mile Section	Anticipated Recurrence Interval (Years) – Any One-Mile Section	Anticipated Unintentional Releases During 50-Year Project Life
All Unintentional Releases (regardless of volume)	0.0022	445	0.00288	347	0.112
Small Unintentional Release ≥1 (42)	0.0021	480	0.00267	374	0.104
≥5 (210)	0.0013	777	0.00165	606	0.064
≥10 (420)	0.0011	950	0.00135	743	0.052
≥50 (2,100)	0.0006	1,712	0.000749	1,335	0.029
Medium Unintentional Release ≥100 (4,200)	0.0005	2,169	0.000591	1,693	0.023
≥500 (21,000)	0.0003	3,827	0.000335	2,986	0.013
Large Unintentional Release ≥1,000 (42,000)	0.0002	5,008	0.000256	3,910	0.010
≥5,000 (210,000)	0.00004	22,492	0.000057	17,640	0.002
Very Large Unintentional Release ≥10,000 (420,000)	0.00003	35,613	0.000036	27,424	0.001

2.8 Existing Pipeline ROW Alternative

Mitigation Segment EP-1

Tables Ap.2-23 and Ap.2-24 present data on unintentional releases for the Existing Pipeline ROW Alternative with Mitigation Segment EP-1.

Table Ap.2-23. Anticipated Pipeline Unintentional Releases from 65.4-Mile, 20-Inch-Diameter SFPP Existing Pipeline ROW Alternative Route, Mitigation Segment EP-1

Unintentional Release Cause	Unintentional Release Rate (releases per 1,000 mile-years)	Pipeline Section Length (miles)	Unintentional Releases per Year	Recurrence Interval (years)
External corrosion	1.00	65.4	0.0654	15
Internal corrosion	0.19	65.4	0.0124	80
3rd party damage	0.40	65.4	0.0262	38
Human operating error	0.11	65.4	0.0072	139
Design flaw	0.03	65.4	0.0020	510
Equipment malfunction	0.37	65.4	0.0242	41
Maintenance	0.07	65.4	0.0046	218
Weld failure	0.26	65.4	0.0170	59
Other	0.45	65.4	0.0294	34
Total, all unintentional releases, regardless of volume	2.88	65.4	0.1884	5
DOT reportable unintentional releases (50 barrels or greater) – 20-inch diameter	1.10	65.4	0.0719	14
Injuries, regardless of severity	0.685	65.4	0.0448	22
Injuries requiring hospitalization, causing loss of consciousness, or preventing discharge of normal duties the day following the incident	0.150	65.4	0.0098	102
Fire	Probability for fire incidents is less than the probability of the releases shown in this table because, in addition to presence of product, a fire requires the presence of an appropriate source of ignition.			
Fatalities	0.042	65.4	0.0027	364

Table Ap.2-24. Anticipated Pipeline Unintentional Releases from 65.4-Mile, 20-Inch-Diameter SFPP Existing Pipeline ROW Alternative Route, Mitigation Segment EP-1

Unintentional Release Volume, Barrels (gallons)	Anticipated Unintentional Releases Per Year – Entire 65.4-Mile Section	Anticipated Recurrence Interval (Years) – Entire 65.4-Mile Section	Anticipated Unintentional Releases Per Year – Any One-Mile Section	Anticipated Recurrence Interval (Years) – Any One-Mile Section	Anticipated Unintentional Releases During 50-Year Project Life
All Unintentional Releases (regardless of volume)	0.1884	5	0.00288	347	9.42
Small Unintentional Release ≥1 (42)	0.1799	6	0.00275	363	9.00
≥5 (210)	0.1373	7	0.00210	476	6.87
≥10 (420)	0.1145	9	0.00175	572	5.71
≥50 (2,100)	0.0719	14	0.00110	907	3.60
Medium Unintentional Release ≥100 (4,200)	0.0545	18	0.000834	1,199	2.73
≥500 (21,000)	0.0318	31	0.000487	2,053	1.59
Large Unintentional Release ≥1,000 (42,000)	0.0251	40	0.000384	2,607	1.25
≥5,000 (210,000)	0.0088	113	0.000135	7,413	0.44
Very Large Unintentional Release ≥10,000 (420,000)	0.0045	222	0.000069	14,594	0.22

Mitigation Segment EP-2

Tables Ap.2-25 and Ap.2-26 present data on unintentional releases for the Existing Pipeline ROW Alternative with Mitigation Segment EP-2.

Table Ap.2-25. Anticipated Pipeline Unintentional Releases from 63.4-Mile, 20-Inch-Diameter SFPP Existing Pipeline ROW Alternative Route, Mitigation Segment EP-2

Unintentional Release Cause	Unintentional Release Rate (releases per 1,000 mile-years)	Pipeline Section Length (miles)	Unintentional Releases per Year	Recurrence Interval (years)
External corrosion	1.00	63.4	0.0634	16
Internal corrosion	0.19	63.4	0.0120	83
3rd party damage	0.40	63.4	0.0254	39
Human operating error	0.11	63.4	0.0070	143
Design flaw	0.03	63.4	0.0019	526
Equipment malfunction	0.37	63.4	0.0235	43
Maintenance	0.07	63.4	0.0044	225
Weld failure	0.26	63.4	0.0165	61
Other	0.45	63.4	0.0285	35
Total, all unintentional releases, regardless of volume	2.88	63.4	0.1826	5
DOT reportable unintentional releases (50 barrels or greater) – 20-inch diameter	1.10	63.4	0.0697	14
Injuries, regardless of severity	0.685	63.4	0.0434	23
Injuries requiring hospitalization, causing loss of consciousness, or preventing discharge of normal duties the day following the incident	0.150	63.4	0.0095	105
Fire	Probability for fire incidents is less than the probability of the releases shown in this table because, in addition to presence of product, a fire requires the presence of an appropriate source of ignition.			
Fatalities	0.042	63.4	0.0027	376

Table Ap.2-26. Anticipated Unintentional Release Volume Distribution from 63.4-Mile, 20-Inch-Diameter SFPP Existing Pipeline ROW Alternative Route, Mitigation Segment EP-2

Unintentional Release Volume, Barrels (gallons)	Anticipated Releases Per Year – Entire 63.4-Mile Section	Anticipated Recurrence Interval (Years) – Entire 63.4-Mile Section	Anticipated Releases Per Year – Any One-Mile Section	Anticipated Recurrence Interval (Years) – Any One-Mile Section	Anticipated Unintentional Releases During 50-Year Project Life
All Unintentional Releases (regardless of volume)	0.1826	5	0.00288	347	9.13
Small Unintentional Release					
≥1 (42)	0.1744	6	0.00275	363	8.72
≥5 (210)	0.1331	8	0.00210	476	6.66
≥10 (420)	0.1110	9	0.00175	572	5.54
≥50 (2,100)	0.0697	14	0.00110	907	3.49
Medium Unintentional Release					
≥100 (4,200)	0.0529	19	0.000834	1,199	2.64
≥500 (21,000)	0.0309	32	0.000487	2,053	1.54
Large Unintentional Release					
≥1,000 (42,000)	0.0243	41	0.000384	2,607	1.22
≥5,000 (210,000)	0.0086	117	0.000135	7,413	0.43
Very Large Unintentional Release ≥10,000 (420,000)	0.0044	229	0.000069	14,594	0.22